JC03 Rec'd PCT/PTO 03 NOV 2001

FORM PTO-1390 (REV. 9-2001) U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY 'S DOCKET NUMBER: West.6492

U S APPLICATION NO. (If known, see 37 CFR 1 5: 10/009385

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP00/01375	19 February 2000	10 May 1999

TITLE OF INVENTION LOCAL NETWORK AND METHOD FOR REPRODUCING AUDIO AND VIDEO DATA IN A NETWORK OF THIS TYPE

APPLICANT(S) FOR DO/EO/US Andreas Stiegler, Detlef Teichner, Michael Maier

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [X] This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. [X] The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [X] is attached hereto (required only if not communicated by the International Bureau).
   b. [ ] has been communicated by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [ ] An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. [ ] is attached hereto.
   b. [ ] has been previously submitted under 35 U.S.C. 154(d)(4).
7. [ ] Amendments to the claims of the International Aplication under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are attached hereto (required only if not communicated by the International Bureau).
   b. [ ] have been communicated by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [ ] have not been made and will not be made.
8. [ ] An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. [ ] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [ ] An English lanugage translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. [X] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [ ] A FIRST preliminary amendment.
14. [ ] A SECOND or SUBSEQUENT preliminary amendment.
15. [ ] A substitute specification.
16. [ ] A change of power of attorney and/or address letter.
17. [ ] A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. [ ] A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. [ ] A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. [X] Other items or information:
    - Copy of International Preliminary Examination Report in German
    - Certificate of Express Mail

JC13 Rec'd PCT/PTO 05 NOV 2001

U.S. APPLICATION NO. (if known, see 37 CFR 1.5) 10/009385	INTERNATIONAL APPLICATION NO PCT/EP00/01375	ATTORNEY'S DOCKET NUMBER West.6492

	CALCULATIONS	PTO USE ONLY
21. [X] The following fees are submitted: **BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):** Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO .... **$1040.00** International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO .... **$890.00** International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO .... **$740.00** International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) .... **$710.00** International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) **$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 890.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than [ ] 20 [X] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$ 130.00	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	$	
Total claims	10 - 20 =	0	x **$18.00**	$	
Independent claims	1 - 3 =	0	x **$84.00**	$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$280.00**	$ 280.00	

TOTAL OF ABOVE CALCULATIONS =	$ 1,300.00	
[ ] Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2. +	$	
SUBTOTAL =	$	
Processing fee of **$130.00** for furnishing the English translation later than [ ] 20 [X] 30 months from the earliest claimed priority date (37 CFR 1.492(f)).	$ 130.00	
TOTAL NATIONAL FEE =	$ 1,430.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +	$	
TOTAL FEES ENCLOSED =	$ 1,430.00	
	Amount to be refunded:	$
	charged:	$

a. [X] A check in the amount of $ 1,020.00 to cover the above fees is enclosed.

b. [X] Please charge my Deposit Account No. 19-0079 in the amount of $ 410.00 to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 19-0079 . A duplicate copy of this sheet is enclosed.

d. [ ] Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Patrick J. O'Shea
Samuels, Gauthier & Stevens, LLP
225 Franklin Street, Suite 3300
Boston, MA 02110
Telephone: (617) 426-9180
Facsimile: (617) 426-2275

Patrick O'Shea
SIGNATURE

Patrick J. O'Shea
NAME

35,305
REGISTRATION NUMBER

Westphal.6492

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: Andres Steigler

GROUP: Not yet assigned

INTERNATIONAL APPLN. NO.: PCT/EP00/01375

EXAMINER: Not yet assigned

SERIAL NO: 10/009,385

INTERNATIONAL FILING DATE: 19 February 2000

FOR: LOCAL NETWORK AND METHOD FOR REPRODUCING AUDIO AND VIDEO DATA IN A NETWORK OF THIS TYPE

PRELIMINARY AMENDMENT

Entry of this preliminary amendment is respectfully requested.

Table of Contents:

Preliminary to calculation of the filing fee, please amend the above-identified application as follows:

10009385 .070502
13 Rec'd PCT/PTO 05 JUL 2002

10/009385

Clean Copy of the Claims

Following Entry of This Amendment

1.(amended) A local network with a plurality of subscribers each connected to a ring network by an optical data line to transmit data, comprising:

a first subscriber is configured as a data source to provide compressed audio and video data;

a second subscriber configured to receive transmitted audio data;

a third subscriber configured to receive the transmitted video data,

a fourth subscriber that includes

(i) a bit stream decoder decode the incoming compressed audio and video data and provide decompressed data;

(ii) a separating stage that receives said decompressed data and separates audio and video data within said compressed data to provide a decompressed video data signal and a decompressed audio data signal; and

(iii) a control unit that controls the transmission of said decompressed video data signal and said decompressed audio data signal onto the ring network.

2.(amended) The local network of claim 1, wherein the bit stream decoder is situated before the separation stage in the data stream of the compressed audio and video data.

3.(amended) The local network of claim 2, comprising several other data sinks which do not have any bit stream decoders and which forward the data conducted to them by the bit stream decoder of the data sink to the output units associated with them.

4.(amended) The local network of claim 1, wherein the data sink with its bit stream decoder is

separate from the other data sinks and is connected through an optical data line.

5.(amended) The local network of claim 4, characterized in that the data sink is connected to its associated output unit for reproducing one type of data, through a common optical data line for transmitting audio as well as video data.

6.(amended) The local network of claim 1, characterized in that the bit stream decoder associated with the data sink is situated in the data stream of compressed audio and video data after the separation stage of the data sink, and that at least one other bit stream decoder in the other data sinks decodes the separated data that are transmitted through the optical data line.

7.(amended) The local network of claim 1, wherein said bit stream decoder comprises an MPEG-1 decoder.

8.(amended) The local network of claim 1, wherein the bit stream decoder can be configured as an MPEG-1 decoder, an MPEG-2 decoder, an AC-3 decoder, or an JPEG decoder depending upon the transmitted control data received over the ring network by the bit stream decoder

9.(amended) A method for reproducing audio and video data in a local network, comprising:

transmitting compressed audio and video data from a data source through an optical data line to a data sink;

receiving said compressed audio and video data;

decompressing received compressed audio and video data to provide decompressed data;

processing said decompressed data at the data sink to provide decompressed audio data and decompressed video data; and

transmitting said decompressed audio data and said decompressed video data from the data sink onto the ring network.

10.(amended) The method of claim 9, wherein said step of receiving, decompressing, processing and transmitting occur in the same data sink.

--11. A method for decompressing audio and video data in a local ring network, comprising:

at a first data sink, (i) receiving compressed data transmitted along a transmission medium of a local ring network at a first data sink, (ii) processing said compressed data to provide a decompressed audio signal, and (ii) transmitting said decompressed audio signal onto the local ring network; and

at a second data sink, (i) receiving the compressed data transmitted along the transmission medium of the local ring network, (ii) processing said compressed data to provide a decompressed video signal, and (ii) transmitting said decompressed audio signal onto the local ring network.--

--12. The local network of claim 1, wherein said bit stream decoder comprises an MPEG-2 decoder.--

--13. The local network of claim 1, wherein said bit stream decoder comprises an AC-3 decoder.--

--14. The local network of claim 1, wherein said bit stream decoder comprises a JPEG decoder.--

--15. The local network of claim 1, wherein said bit stream decoder comprises a video decoder and an audio decoder.--

--16. A subscriber unit for use in a local network that includes a data source which provides compressed multimedia data, a first data sink that plays back decompressed audio data, and a second data sink having a display device that plays back decompressed video data, wherein said subscriber unit, the data source and the first and second data sinks are each connected to a ring network by an optical data line to transmit onto and receive data from the ring network, said subscriber unit comprising:

(i) a bit stream decoder that decodes the compressed audio and video data and provides decompressed data indicative thereof;

(ii) a separating stage that receives said decompressed data, and separates audio and video data within said decompressed data to provide a decompressed video data signal and a decompressed audio data signal; and

(iii) a control unit controls the transmission of said decompressed video data signal and said decompressed audio data signal onto the ring network.--

REMARKS

Claims 1-10 have been amended. Claims 11-16 have been added. Claims 1-16 remain.

The specification has been amended following the translation from German. No new matter has been added.

Examination on the merits is respectfully requested.

If a telephone interview could assist in the prosecution of this application, please call the undersigned attorney.

Respectfully submitted,

Patrick O'Shea

Patrick J. O'Shea
Registration No. 35,305
Samuels, Gauthier & Stevens LLP
225 Franklin Street, Suite 3300
Boston, Massachusetts 02110
Telephone: (617) 426-9180 x121

VERSION WITH MARKINGS TO SHOW CHANGES MADE TO CLAIMS

Amend claims 1-10 as follows:

1.(amended) A local network with a plurality of subscribers ~~several subscribers, which are~~ each connected to a ring network by ~~means of~~ an optical data line ~~(1)~~ to transmit ~~audio and/or video data as well as control~~ data, comprising:

~~with at least one~~ a first subscriber ~~(2), which~~ is configured as a data source ~~(2)~~ to provide ~~for~~ compressed audio and video data;~~,~~

~~with at least one~~ a second subscriber ~~(3), which is~~ configured ~~as a data sink (3) for~~ to receive ~~the~~ transmitted audio data;~~,~~

~~and with at least one more~~ a third subscriber ~~(4), which is~~ configured ~~as a data sink (4) for~~ to receive the transmitted video data,

a fourth ~~such that at least one data sink (5) has~~ subscriber that includes

(i) a bit stream decoder ~~(6) associated with it, to~~ decode the incoming compressed audio and video data and provide decompressed data;

~~,~~ (ii) a separating stage that receives said decompressed data and ~~(7) to~~ separates ~~the jointly transmitted~~ audio and video data within said compressed data to provide a decompressed video data signal and a decompressed audio data signal;~~,~~ and

(iii) a control unit ~~(8)~~ that controls the transmission of said decompressed video data signal and said decompressed audio data signal onto ~~which is designed to conduct one type of transmitted data to an output unit (9) for reproduction, said output unit being associated~~

~~with the data sink (5), and to conduct the other type of data, via~~ the ring network~~optical data line~~. ~~(1), to another data sink (10), which forwards its incoming data to its associated output unit (11) for reproduction.~~

2. (amended) The local network of ~~C~~claim 1, ~~characterized in that~~ wherein the bit stream decoder ~~(6)~~ is situated before the separation stage ~~(7)~~ in the data stream of the compressed audio and video data.

3. (amended) The local network of ~~C~~claim 2, comprising~~characterized by~~ several other data sinks which do not have any bit stream decoders and which forward the data conducted to them by the bit stream decoder of the data sink ~~(5)~~ to the output units associated with them.

4. (amended) The local network of claim 1, ~~one of the preceding claims, characterized~~ wherein ~~in that~~ the data sink ~~(5)~~ with its bit stream decoder ~~(6)~~ is separate from the other data sinks ~~(3, 4, 10)~~ and is connected through an optical data line.

5. (amended) The local network of ~~C~~claims ~~1 and~~ 4, characterized in that the data sink ~~(5)~~ is connected to its associated output unit ~~(9)~~ for reproducing one type of data, through a common optical data line ~~(1)~~ for transmitting audio as well as video data.

6. (amended) The local network of ~~C~~claim 1, characterized in that the bit stream decoder ~~(6)~~ associated with the data sink ~~(5)~~ is situated in the data stream of compressed audio and video data after the separation stage ~~(7)~~ of the data sink ~~(5)~~, and that at least one other bit stream decoder ~~(6)~~

in the other data sinks ~~(3, 4, 10)~~ decodes the separated data that are transmitted through the optical data line.

7.(amended) The local network of claim 1, wherein said ~~one of the preceding claims, characterized in that the~~ bit stream decoder ~~(6)~~ comprises an ~~is an~~ MPEG-1 decoder. ~~, an MPEG-2 decoder, an AC-3 decoder, and/or a JPEG decoder.~~

8.(amended) The local network of claim 1, wherein ~~one of the preceding claims, characterized in that~~ the bit stream decoder ~~(6)~~ can be configured as ~~switched, by means of the transmitted control data, as~~ an MPEG-1 decoder, an MPEG-2 decoder, an AC-3 decoder, or an JPEG decoder depending upon the transmitted control data received over the ring network by the bit stream decoder~~.~~

9.(amended) A method for reproducing audio and video data in a local network, comprising: ~~according to Claim 1, characterized in that~~ transmitting compressed audio and video data ~~are conducted~~ from a data source ~~(2),~~ through an ~~the~~ optical data line ~~(1),~~ to a data sink;

receiving said compressed audio and video data;

decompressing received compressed audio and video data to provide decompressed data;

processing said decompressed data at the data sink to provide decompressed audio data and decompressed video data; and

transmitting said decompressed audio data and said decompressed video data from the data sink onto the ring network.

~~(5), and that, in this data sink (5), the compressed audio and video data are decoded by means of~~

~~the bit stream decoder (6), and then are separated by a separation stage (7) into audio data and video data, and that these separated data are conducted to the separate output units (9, 11) for audio data and video data respectively, and are reproduced there, at least one type of the decoded data being transmitted through the optical data line (1).~~

10.(amended) The method of claim 9, wherein said step of receiving, decompressing, processing and transmitting occur in the same data sink.~~A method for reproducing audio and video data in a local network in accordance with Claim 6, characterized in that the compressed audio and video data are conducted from a data source (2), via the optical data line (1), to a data sink (5), that, in the latter, the compressed audio and video data are separated by means of a separation stage (7), and these separated compressed data are conducted to different bit stream decoders (6) in different data sinks (5, 3, 10), are decoded and then reproduced there, at least one type ofcompressed data being transmitted through the optical data line (1).~~

Add claims 11-16 as follows:

--11. A method for decompressing audio and video data in a local ring network, comprising:

at a first data sink, (i) receiving compressed data transmitted along a transmission medium of a local ring network at a first data sink, (ii) processing said compressed data to provide a decompressed audio signal, and (ii) transmitting said decompressed audio signal onto the local ring network; and

at a second data sink, (i) receiving the compressed data transmitted along the transmission medium of the local ring network, (ii) processing said compressed data to provide a decompressed

video signal, and (ii) transmitting said decompressed audio signal onto the local ring network.--

--12. The local network of claim 1, wherein said bit stream decoder comprises an MPEG-2 decoder.--

--13. The local network of claim 1, wherein said bit stream decoder comprises an AC-3 decoder.--

--14. The local network of claim 1, wherein said bit stream decoder comprises a JPEG decoder.--

--15. The local network of claim 1, wherein said bit stream decoder comprises a video decoder and an audio decoder.--

--16. A subscriber unit for use in a local network that includes a data source which provides compressed multimedia data, a first data sink that plays back decompressed audio data, and a second data sink having a display device that plays back decompressed video data, wherein said subscriber unit, the data source and the first and second data sinks are each connected to a ring network by an optical data line to transmit onto and receive data from the ring network, said subscriber unit comprising:

(i) a bit stream decoder that decodes the compressed audio and video data and provides decompressed data indicative thereof;

(ii) a separating stage that receives said decompressed data, and separates audio and video data within said decompressed data to provide a decompressed video data signal and a decompressed audio data signal; and

(iii) a control unit controls the transmission of said decompressed video data signal and said decompressed audio data signal onto the ring network.--

Clean Copy of the Specification

Following Entry of this Amendment

A Local Network and a Method for Reproducing Audio and Video Data in Such a Network

BACKGROUND OF THE INVENTION

The present invention relates to the field of networks for multimedia systems, and in particular to the field of ring networks for automotive multimedia systems that transmit compressed data from data sources on the network to data sinks on the network for decoding/decompression.

Device combinations are known which consist of two devices: (i) a data source that provides compressed audio and video data (e.g., a DVD player), and (ii) a data sink (e.g., a TV) that reproduces the received audio and video data. The DVD player and the TV are connected to one another through a data line. With this combination, the compressed audio and video data stored on the DVD which are coded, among other standards, by the MPEG-2 standard, are read out, and decoded by an appropriate MPEG-2 decoder in the DVD player, and are thus decompressed. The decompressed data are then transmitted through the data line to the TV. The TV reproduces these decompressed data on its picture tube, for example as an FBAS signal corresponding to the video data received through the TV tuner. In a corresponding manner, the decompressed audio data in the TV receiver are conducted to an amplifier and then to loudspeakers connected thereto, so as to be reproduced. In this system, the data rate transmitted through the data line is very high. This imposes especially stringent requirements on the data line and on the bus which specifies the transmission format of the transmitted, decompressed data. Only a few audio and video signals can be transmitted through this data line simultaneously.

For example, European patent EP 519 111 B1 discloses local networks with several

subscribers, which are connected to one another to form a ring network by an optical data line. The optical data line transmits audio and/or video signals as well as control data. This local network has several subscribers, some of which (data sources) generate audio or video data and control data, and feed these into the ring network. Other subscribers of the network (data sinks) accept the data intended for them, processes the data, and cause them to be reproduced. Data sources can be such as input data into the data line of the network as uncompressed data or as compressed data. Accordingly, the data sinks which receive compressed data have a bit stream decoder, which decodes or decompresses the compressed data, and then these decompressed data are processed for reproduction. The DVD player and TV set described above can be subscribers of this local network. In this case, this device combination will have the disadvantages described previously.

Therefore, there is a need for system that does not require each data sink to include a decoder.

SUMMARY OF THE INVENTION

Briefly, according to an aspect of the invention, a method for reproducing audio and video data in a local network includes transmitting compressed audio and video data from a data source through an optical data line to a data sink, and decompressing the received compressed audio and video data to provide decompressed data. The decompressed data is processed at the data sink to provide decompressed audio data and decompressed video data. The decompressed audio data and the decompressed video data are transmitted from the data sink onto the ring network.

According to another aspect of the invention, a method for decompressing audio and video data in a local ring network includes, at a first data sink, (i) receiving compressed data transmitted

along a transmission medium of a local ring network at a first data sink, (ii) processing the compressed data to provide a decompressed audio signal, and (ii) transmitting the decompressed audio signal onto the local ring network. At a second data sink, (i) receiving the compressed data transmitted along the transmission medium of the local ring network, (ii) processing the compressed data to provide a decompressed video signal, and (ii) transmitting the decompressed audio signal onto the local ring network.--

The inventive local network, which is ideally suited for implementation in an automobile, transmits audio and video data jointly in compressed form from the data source, through the data line, to a data sink. In this data sink, the compressed audio and video data can first be conducted to a bit stream decoder to be jointly decoded (decompressed), and then conducted to a separation stage for separating the decompressed audio data from the decompressed video data, and then at least one data type is conducted, via the optical data line, to another subscriber of the network in order to be reproduced there.

Alternatively, the jointly transmitted compressed audio and video data are first conducted to a separation stage to separate the compressed audio data from the compressed video data, and these separated data types are subsequently each conducted to a bit stream decoder and then to an output unit. At least one type of decompressed data is conducted, through the optical data line, to the output unit. The separation stage can here form a single unit with the bit stream decoder. If the local network is structured in this manner, the various data sources can make do without the decoders which they have previously contained, for example the bit stream decoder in a DVD player. In a DVD player, the bit stream decoder for video data may be an MPEG-2 decoder, and for the audio data it is an MPEG-2 or a Dolby digital decoder. If, for example, several such data sources are to be disposed in a network, the invention now makes it possible to make do without

this plurality of bit stream decoders in the individual data sources for the joint transmission of audio and video data. This reduces the costs of the network together with its subscribers.

Only at the relevant data sink or sinks for compressed data is there a single bit stream decoder for decompressing the corresponding video data and audio data, which regularly results in a reduction of the decoder components in the data sinks.

The joint transmission of compressed audio and video data from the data source to the data sink or sinks utilizes the data transmission capacity of the network more efficiently. If the jointly transmitted audio and video data are first completely decoded by a bit stream decoder before they are separated by the separation stage, standardized devices for reproducing audio data or video data can be used as output units or as further data sinks. Typical devices for reproducing audio data are audio amplifiers with loudspeakers connected to them, and typical devices for reproducing video data are screens or projectors. In such a structure of the local network, the decompressed audio data and video data can also be reproduced by a network subscriber which is intended to reproduce other audio or video data from other data sources. This synergistic utilization of available subscribers for reproducing, for example, the audio data in a non-compressed form reduces the costs of the local network with its various data sources and data sinks. One or both types of decompressed data, that is audio and also video data, can be conducted through the optical data line to the appropriate subscribers for reproducing these data. The efficiency of data transmission is noticeably improved compared to the transmission of the pure decompressed data.

In one embodiment, the jointly transmitted audio and video data are first separated from one another in a first data sink by a separation stage. The separated data are then individually decoded in separate bit stream decoders, and are conducted, as decompressed audio data and compressed video data to the appropriate output units for reproduction. The compressed audio

data and/or the compressed video data of the optical data line are here conducted to the local network and, through this, to an appropriate subscriber, which acts as a centralized data sink for these particular compressed data types. This data sink contains the bit stream decoder for decoding the received, compressed data. The bit stream decoder is centralized at the reproduction site, which reduces the number of bit stream decoders for the audio data and video data for the entire local network. This structure of the inventive local network with transmission of the compressed audio data and transmission of the compressed video data optimally utilizes the maximum transmission capacity of the ring network.

The local network includes a control unit, which is preferably situated in a data sink, and controls the transmission of the data, whether these be compressed audio data, compressed video data, decompressed audio data and/or decompressed video data. These data are transmitted via the optical data line of the local network to the appropriate other subscribers so that they can be reproduced there. This control unit assures that, at each moment, the appropriate transmission capacity for the transmission of data through the optical data line will be available. This control unit assures the allocation of the required data channels in the local network.

The data connection between the data sources and the data sinks can be controlled by control data transmitted through the data line. This assures a reliable buildup of the data connections, the assignment of the data sinks to the data sources, control of reproduction in the data sinks, and control of data decoding. In particular, it has proven beneficial to switch the bit stream decoder between several modes of decoding function by the transmitted control data. In this way, a single bit stream decoder, which especially is situated in the data stream before the separation stage, can read several compressed data formats and can correctly decompress them in accordance with the selected decoding function. It has proven beneficial to have a decoder for the

video data compression formats, which typically comprise for example the MPEG-1 format, the MPEG-2 format, and the JPEG format, as well as for the audio data compression formats, mainly the AC-3, the MPEG-1, and the MPEG-2. This capability of switching the bit stream decoder between the individual decoding formats, can further reduce the number of required bit stream decoders and thus reduce the costs of the local network.

These and other objects, features and advantages of the present invention will become more apparent in light of the following detailed description of preferred embodiments thereof, as illustrated in the accompanying drawings.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. 1 is a functional block diagram illustration of a multimedia local network having a centralized bit stream decoder; and

FIG. 2 is a functional block diagram illustration of an alternative embodiment multimedia local network.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 is a functional block diagram illustration of a multimedia local network 100. The network includes a plurality of subscribers 2, 3, 4, 5, which are connected in a ring through an optical data line 1. Each of the subscribers 2, 3, 4, 5 has two connections to the optical data line 1, one to an incoming optical data line 1, and one to an outgoing optical data line 1. Audio data, video data, and also control data are exchanged among the individual subscribers through the optical data line 1.

The subscribers 2 is configured as a data source for compressed audio and video data. For

example, the subscriber 2 may include a DVD player, which provides compressed audio and video data, and outputs the compressed audio and video data jointly, to its outgoing data line 1. The jointly transmitted compressed audio and video data are conducted via the optical data line 1 to the data sink 5. The data sink 5 includes a bit stream decoder 6, which decodes and decompresses the audio and video data, and provides decompressed audio data and video data provided to a separation stage 7. The separation stage 7 separates the jointly decoded audio and video data according to their type, and outputs these to the optical data line 1 for forwarding to the other data sinks 3, 4.

The data sink 5 also includes a control unit 8 that controls transmission of the mutually separated, decompressed data types to the other data sinks 3, 4. The control unit 8 assures the allocation of the mutually separated, decompressed data types to the individual data channels in the single optical data line 1.

The separately transmitted, decompressed audio data and video data are conducted to the data sink 4, which has a display screen 9. The decompressed input video data are processed in the data sink 4 into for example an electrical FBAS signal, which is used to drive the display 9, so the video signals can be reproduced visually.

The decompressed audio data are conducted, via the data sink 4 and the data source 2, to the data sink 3, where the decompressed audio data are processed, amplified, and are acoustically reproduced by the connected output units, for example, loudspeakers 11. The audio signals conducted through the data line 1 may also be processed digitally, especially by equalizing, fading, delay lines, and the like.

Notably, the local network of FIG. 1 has an economical data source 2, which does not require a bit stream decoder, and which outputs the generated audio and video data in compressed

form to the data line 1. This loading of the network with compressed data by the data source 2 results in efficient utilization of the transmission capacity of the network. Furthermore, the local network preferably has a single bit stream decoder 6 in a central data sink 5. The single bit stream decoder 6 decodes the compressed audio and video data which are jointly conducted to it from the data source 2, and conducts the decompressed data via the optical data line 1 to the appropriate output units 9, 11, where they are reproduced. The use of a single bit stream decoder 6 results in a very economical design for the local network.

The bit stream decoder 6 decodes the compressed audio data and decompressed video data jointly and simultaneously in accordance with the particular compression format, and conducts these decoded, decompressed audio and video data to the separation stage 7.

Despite the increased power required for the bit stream decoder 6, this centralization makes the local network more economical than systems that include distributed decoding/decompression. This is true all the more so if several data sources and/or data sinks are present in addition to the single data source 2 and the single data sink 3 for audio data and the single data sink 4 for video data.

A ring topology and with a single optical data line 1, prevents undesirable interference from entering the data line. This is particularly desirable for applications in automobiles. The ring topology makes it possible to do without network nodes, and as a result utilizes the maximum transmission capacity of the optical data line and respectively of the ring network. This achieves a local network which is not only economical but which efficiently utilizes its maximum transmission capacity.

FIG. 2 is a functional block diagram illustration of an alternative embodiment multimedia local network. In this embodiment of the local network, the subscribers 2, 3, 5 are connected

through the optical ring data line 1. The data source 2 corresponds to data source 2, as this is shown in FIG. 1. It generates compressed audio and video data and outputs these to the optical data line 1. These data then pass through the data sink 3 to the data sink 5, which, by means of the separation stage 7, divides these compressed audio and video data into compressed audio data and compressed video data. The control unit 8 allocates the data channels in the optical data line 1 of the local network, for transmission of the compressed audio data to the data sink 3, 10, and for transmission of the compressed video data to the output unit 9 for video data.

This output unit 9 has a bit stream decoder 6, which converts the compressed video data into a decompressed video signal, here an electrical RGB signal, which is reproduced on the display of the output unit 9.

The data sink 3, 10 for the compressed audio data also has a bit stream decoder 6, which here is designed as an AC-3 decoder. The AC-3 decoder decodes the compressed audio data, and provides decompressed audio data to a processing and amplification stage 12, which again conducts the processed and amplified audio signals to the loudspeakers 11.

This inventive structure of the local network, with a separation stage 7 in the compressed data stream, situated before the respective bit stream decoder 6 assigned to it, optimally utilizes the maximum transmission capacity of the local network. Exclusively compressed audio and video data are transmitted on the optical data lines 1 between the individual subscribers 2, 3, 5. Although this structure has a plurality of bit stream decoders 6, these are designed very specifically only as audio bit stream decoders 6 for decoding compressed audio data or only as video bit steam decoders for decoding compressed video data. Through this specific requirement, it is possible, despite the greater number of bit stream decoders 6, to keep the costs of the local network low, taking into account the optimized efficiency in utilizing the maximum transmission

capacity of the network.

Although the present invention has been shown and described with respect to several preferred embodiments thereof, various changes, omissions and additions to the form and detail thereof, may be made therein, without departing from the spirit and scope of the invention.

What is claimed is:

Marked-up copy of the specification

~~**Description**~~

A Local Network and a Method for Reproducing Audio and Video Data in Such a Network

BACKGROUND OF THE INVENTION

The present invention relates to the field of networks for multimedia systems, and in particular to the field of ring networks for automotive multimedia systems that transmit compressed data from data sources on the network to data sinks on the network for decoding/decompression. ~~The description relates to a local network with several subscribers, which are connected to one another to form a ring network, by means of an optical data line for transmitting audio and/or video data as well as control data, also to a method for reproducing audio and video data in this local network.~~

Device combinations are known which consist of two devices: ~~,~~(i) a data source that provides ~~for~~ compressed audio and video data (e.g., ~~, for example~~ a DVD player), and (ii) a data sink (e.g., ~~, for example~~ a TV ~~set~~)~~,~~ ~~which~~ that reproduces the received audio and video data. ~~conducted to it, by means of its loudspeakers and its picture tube.~~ The DVD player and the TV ~~set~~ are ~~here~~ connected to one another through a data line. With this combination, the compressed audio and video data stored on the ~~digital versatile disk (~~DVD~~), that is both audio and video data,~~ which are coded, among other standards, by the MPEG-2 standard, are read out, ~~are~~and decoded by an appropriate MPEG-2 decoder in the DVD player, and are thus decompressed. ~~Then t~~The decompressed data are then transmitted through the data line to the TV. ~~set.~~ The TV ~~set~~ reproduces these decompressed data on its picture tube, for example as an FBAS signal corresponding to the video data received through the TV tuner. In a corresponding manner, the decompressed audio data in the TV receiver are conducted to an amplifier and then to loudspeakers

connected thereto, so as to be reproduced. In this system, the data rate transmitted through the data line is very high. This imposes especially stringent requirements on the data line and on the bus which specifies the transmission format of the transmitted, decompressed data. Only a few audio and video signals can be transmitted through this data line simultaneously.

For example, European patent ~~the new~~ EP 519 111 B1 discloses local networks with several subscribers, which are connected to one another to form a ring network~~,~~ by ~~means of~~ an optical data line. The optical data line transmits audio and/or video signals as well as control data. This local network has several subscribers, some of which (data sources) generate audio or video data and control data, and feed these into the ring network. Other -subscribers of the network (data sinks) accept the data intended for them, processes the~~se~~ data, and cause them to be reproduced. Data sources can be such as input data into the data line of the network as uncompressed data or as compressed data. Accordingly, the data sinks which receive compressed data have a bit stream decoder, which decodes or decompresses the compressed data, and then these decompressed data are processed for reproduction. The DVD player and TV set described above can be subscribers of this local network. In this case, this device combination will have the disadvantages described previously.

Therefore, there is a need for system that does not require each data sink to include a decoder.

~~It is the object of the invention to create a local network, especially for automotive applications, which optimally utilizes the maximum transmission capacity of the network and which at the same time is as economical as possible.~~

~~The invention achieves this object by a local network with the characteristics of Claim 1, and by a method for transmitting audio and video data in a local network with the characteristics of~~

~~Claims 9 and 10.~~

~~Advantageous developments are found in the subclaims.~~

SUMMARY OF THE INVENTION

Briefly, according to an aspect of the invention, a method for reproducing audio and video data in a local network includes transmitting compressed audio and video data from a data source through an optical data line to a data sink, and decompressing the received compressed audio and video data to provide decompressed data. The decompressed data is processed at the data sink to provide decompressed audio data and decompressed video data. The decompressed audio data and the decompressed video data are transmitted from the data sink onto the ring network.

According to another aspect of the invention, a method for decompressing audio and video data in a local ring network includes, at a first data sink, (i) receiving compressed data transmitted along a transmission medium of a local ring network at a first data sink, (ii) processing the compressed data to provide a decompressed audio signal, and (ii) transmitting the decompressed audio signal onto the local ring network. At a second data sink, (i) receiving the compressed data transmitted along the transmission medium of the local ring network, (ii) processing the compressed data to provide a decompressed video signal, and (ii) transmitting the decompressed audio signal onto the local ring network.--

The inventive local network, which is ideally suited for implementation in an automobile, transmits audio and video data jointly in compressed form from the data source, through the data line, to a data sink. In this data sink, the compressed audio and video data can first be conducted to a bit stream decoder to be jointly decoded (decompressed), and then conducted to a separation

stage for separating the decompressed audio data from the decompressed video data, and then at least one data type is conducted, via the optical data line, to another subscriber of the network in order to be reproduced there.

Alternatively, the jointly transmitted compressed audio and video data are first conducted to a separation stage to separate the compressed audio data from the compressed video data, and these separated data types are subsequently each conducted to a bit stream decoder and then to an output unit. At least one type of decompressed data is conducted, through the optical data line, to the output unit. The separation stage can here form a single unit with the bit stream decoder. If the local network is structured in this manner, the various data sources can make do without the decoders which they have previously contained, for example the bit stream decoder in a DVD player. In a DVD player, the bit stream decoder for video data may be ~~is~~ an MPEG-2 decoder, and for the audio data it is an MPEG-2 or a Dolby digital decoder. If, for example, several such data sources are to be disposed in a network, the invention now makes it possible to make do without this plurality of bit stream decoders in the individual data sources for the joint transmission of audio and video data. This reduces the costs of the network together with its subscribers.

Only at the relevant data sink or sinks for compressed data is there a single bit stream decoder for decompressing the corresponding video data and audio data, which regularly results in a reduction of the decoder components in the data sinks.

The joint transmission of compressed audio and video data from the data source to the data sink or sinks utilizes the ~~maximum~~ data transmission capacity of the network more efficiently. ~~much better.~~ If the jointly transmitted audio and video data are first completely decoded by a bit stream decoder before they are separated by the separation stage, standardized

devices for reproducing audio data or video data can be used as output units or as further data sinks. Typical devices for reproducing audio data are audio amplifiers with loudspeakers connected to them, and typical devices for reproducing video data are screens or projectors. In such a structure of the local network, the decompressed audio data and video data can also be reproduced by a network subscriber which is intended to reproduce other audio or video data from other data sources. This synergistic utilization of available subscribers for reproducing, for example, the audio data in a non-compressed form ~~substantially~~ reduces the costs of the local network with its various data sources and data sinks. One or both types of decompressed data, that is audio and also video data, can ~~here~~ be conducted~~,~~ through the optical data line~~,~~ to the appropriate subscribers for reproducing these data. ~~In this case, too, t~~The efficiency of data transmission is noticeably improved compared to the transmission of the pure decompressed data. ~~transmission.~~

In one embodiment, ~~According to a special development of the invention,~~ the jointly transmitted audio and video data are first separated from one another in a first data sink by ~~means of~~ a separation stage. The separated data are then ~~Not until the following step, are they~~ individually decoded in separate bit stream decoders, and are conducted, as decompressed audio data and compressed video data~~respectively,~~ to the appropriate output units for reproduction. The compressed audio data and/or the compressed video data of the optical data line ~~[sic]~~ are here conducted to the local network and, through this, to an appropriate subscriber, which acts as a centralized data sink for these particular compressed data types. This data sink contains the bit stream decoder for decoding the received, compressed data. The bit stream decoder is ~~thus~~ centralized at the reproduction site, which ~~thus~~ reduce~~s~~es~~ing~~ the number of bit stream decoders for the audio data and video data for the entire local network. This structure of the inventive local

network with transmission of the compressed audio data and transmission of the compressed video data optimally utilizes the maximum transmission capacity of the ring network.

The ~~inventive~~ local network includes ~~contains~~ a control unit, which is preferably ~~is~~ situated in a data sink, and ~~which~~ controls the transmission of the data, whether these be compressed audio data, compressed video data, decompressed audio data and/or decompressed video data. These data are transmitted~~,~~ via the optical data line of the local network~~,~~ to the appropriate other subscribers~~,~~ so that they can be reproduced there. This control unit assures that, at each moment, the appropriate transmission capacity for the transmission of data through the optical data line will be available. This control unit assures the allocation of the required data channels in the local network.

~~In an advantageous development of the invention, t~~The data connection between the data sources and the data sinks can be controlled by ~~means of~~ control data transmitted through the data line. This assures a reliable buildup of the data connections, the assignment of the data sinks to the data sources, control of reproduction in the data sinks, and control of data decoding. In particular, it has proven beneficial to switch the bit stream decoder between several modes of decoding function~~,~~ by ~~means of~~ the transmitted control data. In this way, a single bit stream decoder, which especially is situated in the data stream before the separation stage, can read several compressed data formats and can correctly decompress them in accordance with the selected decoding function. It has proven beneficial to have a decoder for the video data compression formats, which typically comprise for example the MPEG-1 format, the MPEG-2 format, and the JPEG format, as well as for the audio data compression formats, mainly the AC-3, the MPEG-1, and the MPEG-2. This capability of switching the bit stream decoder between the individual decoding formats, can further reduce the number of required bit stream decoders and

thus ~~thereby can further~~ reduce the costs of the local network.

These and other objects, features and advantages of the present invention will become more apparent in light of the following detailed description of preferred embodiments thereof, as illustrated in the accompanying drawings.

DETAILED DESCRIPTION OF THE DRAWINGS

~~Two preferred embodiments of the invention are shown in the drawings.~~

FIG.~~igure~~ 1 is a functional block diagram illustration of a multimedia ~~shows an exemplary~~ local network having a centralized ~~, in which the~~ bit stream decoder; and~~is situated before the separation stage.~~

FIG. ~~igure~~ 2 is a functional block diagram illustration of an alternative embodiment multimedia local network. ~~shows an exemplary local network, in which the separation stage is situated before the bit stream decoders.~~

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 is a functional block diagram illustration of a multimedia local network 100. The network includes ~~The local network shown in Figure 1 has four~~ a plurality of subscribers 2, 3, 4, 5, which are connected in a ring through an optical data line 1. Each of the subscribers 2, 3, 4, 5 has two connections to the optical data line 1, one to an incoming optical data line 1, and one to an outgoing optical data line 1. Audio data, video data, and also control data are exchanged among the individual subscribers through the optical data line 1.

The ~~S~~subscribers 2 is configured as a data source ~~2~~ for compressed audio and video data. For example, the subscriber 2 may include ~~This is~~ a DVD player, which provides ~~which delivers~~

~~both~~ compressed audio and video data~~ in compressed form~~, and ~~which~~ outputs these compressed audio and video data jointly, ~~without any further processing in the sense of decompression,~~ to its outgoing data line 1. The jointly transmitted compressed audio and video data are conducted~~,~~ via~~through~~ the~~is~~ optical data line 1~~,~~ to the data sink 5. The data sink 5 includes~~, which conducts its incoming data to~~ a bit stream decoder 6, which~~. This bit stream decoder 6~~ decodes and decompresses the audio and video data, and provides~~ into~~ decompressed audio data and video data ~~.~~ provided ~~These are finally conducted~~ to a separation stage 7.~~, which is part of the data sink 5.~~ The~~is~~ separation stage 7 separates the jointly decoded audio and video data according to their type, and outputs these to the optical data line 1 for forwarding to the other data sinks 3, 4.

The data sink 5 also includes ~~has~~ a control unit 8~~, which~~ that controls transmission of the mutually separated, decompressed data types~~, that is audio data and video data, from the data sink 5, through the optical data line 1,~~ to the other data sinks 3, 4. The~~is~~ control unit 8 ~~here~~ assures the allocation of the mutually separated, decompressed data types to the individual data channels in the single optical data line 1.

The separately transmitted, decompressed audio data and video data ~~are situated after the data sink 5 in the direction of data flow. They~~ are conducted to the data sink 4, which has a display screen 9. The decompressed input video data are processed in the data sink 4 into for example an electrical FBAS signal, which is used to drive the ~~picture tube~~ display 9, so ~~. By means of this video signal,~~ the video signals can be reproduced visually.

The decompressed audio data are conducted, via the data sink 4 and the data source 2, to the data sink 3, ~~10,~~ where the decompressed audio data are processed, amplified, and are acoustically reproduced by the connected output units, for example, ~~in the form of~~ loudspeakers 11. The audio signals conducted through the data line 1 may also be ~~are also~~ processed digitally,

especially by equalizing, fading, delay lines, and the like.

Notably, the~~This~~ local network of FIG.~~igure~~ 1 has an ~~very~~ economical data source 2, which does not require ~~has no~~ a bit stream decoder, and which outputs the generated audio and video data in compressed form to the data line 1. This loading of the network with compressed data by the data source 2 results in efficient utilization of the transmission capacity of the network. Furthermore, the local network preferably has a single bit stream decoder 6 in a central data sink ~~3~~5. The~~is~~ single bit stream decoder 6 decodes the compressed audio and video data which are jointly conducted to it from the data source 2, and conducts the decompressed data~~,~~ via the optical data line 1~~,~~ to the appropriate output units 9, 11, where they are reproduced. The use of a single bit stream decoder 6 results in a very economical design for the local network.

The bit stream decoder 6 ~~is able to~~ decodes the compressed audio data and decompressed video data jointly and simultaneously in accordance with the particular compression format, and ~~to~~ conducts ~~[this word in missing in the German]~~ these decoded, decompressed audio and video data to the separation stage 7.~~, where these decompressed data are separated into individual data streams for audio data and video data.~~

Despite the increased power required for the bit stream decoder 6, this centralization makes the local network ~~very~~ more economical than systems that include distributed decoding/decompression. This is true ~~A~~all the more so if several data sources and/or data sinks are present in addition to the single data source 2 and the single data sink 3 for audio data and the single data sink 4 for video data. ~~Through the special design of the local network with the data sink 5, with its central bit stream decoder 6, all of these can be designed without their own bit stream decoder.~~

~~This special design of the network, with a~~A ring topology and with a single optical data

line 1, ~~in addition~~ prevents undesirable interference from entering the data line. This is particularly desirable for applications in automobiles. ~~of special interest for automotive use of the local network. This especially enhances the electromagnetic compatibility of the local network.~~ The ring topology makes it possible to do without network nodes, and as a result ~~which excellently~~ utilizes the maximum transmission capacity of the optical data line and respectively of the ring network. This achieves a local network which is not only economical but which efficiently utilizes its maximum transmission capacity. ~~especially efficiently.~~

FIG. 2 is a functional block diagram illustration of an alternative embodiment multimedia local network. ~~The~~In this ~~second preferred~~ embodiment of the local network, ~~as shown in Figure 2, has three~~ the subscribers 2, 3, 5~~, which~~ are connected ~~to one another~~ through the optical ring data line 1. The data source 2 corresponds to data source 2, as this is shown in FIG.~~igure~~ 1. It generates compressed audio and video data and outputs these to the optical data line 1. These data then pass through the data sink 3 to the data sink 5, which, by means of the separation stage 7, divides these compressed audio and video data into compressed audio data and compressed video data. The control unit 8 allocates the data channels in the optical data line 1 of the local network, for transmission of the compressed audio data to the data sink 3, 10, and for transmission of the compressed video data to the output unit 9 for video data.

This output unit 9 has a bit stream decoder 6, which converts the compressed video data into a decompressed video signal, here an electrical RGB signal, which is reproduced on the display of the output unit 9.

The data sink 3, 10 for the compressed audio data also has a bit stream decoder 6, which here is designed as an AC-3 decoder. The~~is~~ AC-3 decoder decodes the compressed audio data, and provides decompressed audio data ~~conducts them~~ to a processing and amplification stage 12,

which again conducts the processed and amplified audio signals to the loudspeakers 11. ~~The latter convert the electrical audio signal from the processing and amplification stage 12 into an acoustic audio signal.~~

This inventive structure of the local network, with a separation stage 7 in the compressed data stream, situated before the respective bit stream decoder 6 assigned to it, optimally utilizes the maximum transmission capacity of the local network. Exclusively compressed audio and video data are transmitted on the optical data lines 1 between the individual subscribers 2, 3, 5. Although this structure has a plurality of bit stream decoders 6, these are designed very specifically only as audio bit stream decoders 6 for decoding compressed audio data or only as video bit steam decoders for decoding compressed video data. Through this specific requirement, it is possible, despite the greater number of bit stream decoders 6, to keep the costs of the local network low, taking into account the optimized efficiency in utilizing the maximum transmission capacity of the network.

Although the present invention has been shown and described with respect to several preferred embodiments thereof, various changes, omissions and additions to the form and detail thereof, may be made therein, without departing from the spirit and scope of the invention.

What is claimed is:

~~List of Reference Symbols~~

~~1 Optical data line~~

~~2 Data source~~

~~3 Data sink for the transmitted audio data~~

~~4 Data sink for the transmitted video data~~

~~5 Data sink~~

~~6 Bit stream decoder~~

~~7 Separation stage~~

~~8 Control unit~~

~~9 Output unit for video data~~

~~10 Data sink~~

~~11 Loudspeaker~~

~~12 Processing and amplification unit for audio signals~~

13 Rec'd PCT/PTO 05 JUL 2002
10/009385

Description

A Local Network and a Method for Reproducing Audio and Video Data in Such a Network

The description relates to a local network with several subscribers, which are connected to one another to form a ring network, by means of an optical data line for transmitting audio and/or video data as well as control data, also to a method for reproducing audio and video data in this local network.

Device combinations are known which consist of two devices, a data source for compressed audio and video data, for example a DVD player, and a data sink, for example a TV set, which reproduces the audio and video data conducted to it, by means of its loudspeakers and its picture tube. The DVD player and the TV set are here connected to one another through a data line. With this combination, the compressed data stored on the digital versatile disk (DVD), that is both audio and video data, which are coded, among other standards, by the MPEG-2 standard, are read out, are decoded by an appropriate MPEG-2 decoder in the DVD player, and are thus decompressed. Then the decompressed data are transmitted through the data line to the TV set. The TV set reproduces these decompressed data on its picture tube, for example as an FBAS signal corresponding to the video data received through the TV tuner. In a corresponding manner, the decompressed audio data in the TV receiver are conducted to an amplifier and then to loudspeakers connected thereto, so as to be reproduced. In this system, the data rate transmitted through the data line is very high. This imposes especially stringent requirements on the data line and on the bus which specifies the transmission format of the transmitted, decompressed data. Only a few audio and video signals can be transmitted through this data line simultaneously.

For example, the new EP 519 111 B1 discloses local networks with several subscribers, which are connected to one another to form a ring network, by means of an optical data line. The optical data line transmits audio and/or video signals as well as control data. This local network has several subscribers, some of which (data sources) generate audio or video data and control data, and feed these into the ring network. Other subscribers of the network (data sinks) accept the data intended for them, processes these data, and cause them to be reproduced. Data sources can be such as input data into the data line of the network as uncompressed data or as compressed data. Accordingly, the data sinks which receive compressed data have a bit stream decoder, which decodes or decompresses the compressed data, and then these decompressed data are processed for reproduction. The DVD player and TV set described above can be subscribers of this local network. In this case, this device combination will have the disadvantages described previously.

It is the object of the invention to create a local network, especially for automotive applications, which optimally utilizes the maximum transmission capacity of the network and which at the same time is as economical as possible.

The invention achieves this object by a local network with the characteristics of Claim 1, and by a method for transmitting audio and video data in a local network with the characteristics of Claims 9 and 10.

Advantageous developments are found in the subclaims.

The inventive local network, which is ideally suited

for implementation in an automobile, transmits audio and video data jointly in compressed form from the data source, through the data line, to a data sink. In this data sink, the compressed audio and video data can first be conducted to a bit stream decoder to be jointly decoded (decompressed), and then conducted to a separation stage for separating the decompressed audio data from the decompressed video data, and then at least one data type is conducted, via the optical data line, to another subscriber of the network in order to be reproduced there. Alternatively, the jointly transmitted compressed audio and video data are first conducted to a separation stage to separate the compressed audio data from the compressed video data, and these separated data types are subsequently each conducted to a bit stream decoder and then to an output unit. At least one type of decompressed data is conducted, through the optical data line, to the output unit. The separation stage can here form a single unit with the bit stream decoder. If the local network is structured in this manner, the various data sources can make do without the decoders which they have previously contained, for example the bit stream decoder in a DVD player. In a DVD player, the bit stream decoder for video data is an MPEG-2 decoder, and for the audio data it is an MPEG-2 or a Dolby digital decoder. If, for example, several such data sources are to be disposed in a network, the invention now makes it possible to make do without this plurality of bit stream decoders in the individual data sources for the joint transmission of audio and video data. This reduces the costs of the network together with its subscribers.

Only at the relevant data sink or sinks for compressed data is there a single bit stream decoder for decompressing the corresponding video data and audio data, which regularly results in a reduction of the decoder

components in the data sinks.

The joint transmission of compressed audio and video data from the data source to the data sink or sinks utilizes the maximum data transmission capacity of the network much better. If the jointly transmitted audio and video data are first completely decoded by a bit stream decoder before they are separated by the separation stage, standardized devices for reproducing audio data or video data can be used as output units or as further data sinks. Typical devices for reproducing audio data are audio amplifiers with loudspeakers connected to them, and typical devices for reproducing video data are screens or projectors. In such a structure of the local network, the decompressed audio data and video data can also be reproduced by a network subscriber which is intended to reproduce other audio or video data from other data sources. This synergistic utilization of available subscribers for reproducing, for example, the audio data in a non-compressed form substantially reduces the costs of the local network with its various data sources and data sinks. One or both types of decompressed data, that is audio and also video data, can here be conducted, through the optical data line, to the appropriate subscribers for reproducing these data. In this case, too, the efficiency of data transmission is noticeably improved compared to pure decompressed data transmission.

According to a special development of the invention, the jointly transmitted audio and video data are first separated from one another in a first data sink by means of a separation stage. Not until the following step, are they individually decoded in separate bit stream decoders, and are conducted, as decompressed audio data and video data respectively, to the appropriate output units for reproduction. The compressed

audio data and/or the compressed video data of the optical data line [sic] are here conducted to the local network and, through this, to an appropriate subscriber, which acts as a centralized data sink for these particular compressed data types. This data sink contains the bit stream decoder for decoding the received, compressed data. The bit stream decoder is thus centralized at the reproduction site, thus reducing the number of bit stream decoders for the audio data and video data for the entire local network. This structure of the inventive local network with transmission of the compressed audio data and transmission of the compressed video data optimally utilizes the maximum transmission capacity of the ring network.

The inventive local network contains a control unit, which preferably is situated in a data sink, and which controls the transmission of the data, whether these be compressed audio data, compressed video data, decompressed audio data and/or decompressed video data. These data are transmitted. via the optical data line of the local network, to the appropriate other subscribers, so that they can be reproduced there. This control unit assures that, at each moment, the appropriate transmission capacity for the transmission of data through the optical data line will be available. This control unit assures the allocation of the required data channels in the local network.

In an advantageous development of the invention, the data connection between the data sources and the data sinks can be controlled by means of control data transmitted through the data line. This assures a reliable buildup of the data connections, the assignment of the data sinks to the data sources, control of reproduction in the data sinks, and control of data decoding. In particular, it has proven beneficial

to switch the bit stream decoder between several modes of decoding function, by means of the transmitted control data. In this way, a single bit stream decoder, which especially is situated in the data stream before the separation stage, can read several compressed data formats and can correctly decompress them in accordance with the selected decoding function. It has proven beneficial to have a decoder for the video data compression formats, which typically comprise the MPEG-1 format, the MPEG-2 format, and the JPEG format, as well as for the audio data compression formats, mainly the AC-3, the MPEG-1, and the MPEG-2. This capability of switching the bit stream decoder between the individual decoding formats, can further reduce the number of required bit stream decoders and thereby can further reduce the costs of the local network.

Two preferred embodiments of the invention are shown in the drawings.

Figure 1 shows an exemplary local network, in which the bit stream decoder is situated before the separation stage.

Figure 2 shows an exemplary local network, in which the separation stage is situated before the bit stream decoders.

The local network shown in Figure 1 has four subscribers 2, 3, 4, 5, which are connected in a ring through an optical data line 1. Each subscriber 2, 3, 4, 5 has two connections to the optical data line 1, one to an incoming optical data line 1, and one to an outgoing optical data line 1. Audio data, video data, and also control data are exchanged among the individual subscribers through the optical data line 1.

Subscriber 2 is a data source 2 for compressed audio and video data. This is a DVD player, which delivers both audio and video data in compressed form, and which outputs these compressed

audio and video data jointly, without any further processing in the sense of decompression, to its outgoing data line 1. The jointly transmitted compressed audio and video data are conducted, through this optical data line 1, to the data sink 5, which conducts its incoming data to a bit stream decoder 6. This bit stream decoder 6 decodes and decompresses the audio and video data into decompressed audio data and video data. These are finally conducted to a separation stage 7, which is part of the data sink 5. This separation stage 7 separates the jointly decoded audio and video data according to their type, and outputs these to the optical data line 1 for forwarding to the other data sinks 3, 4. The data sink 5 has a control unit 8, which controls transmission of the mutually separated, decompressed data types, that is audio data and video data, from the data sink 5, through the optical data line 1, to the other data sinks 3, 4. This control unit 8 here assures the allocation of the mutually separated, decompressed data types to the individual data channels in the single optical data line 1.

The separately transmitted, decompressed audio data and video data are situated after the data sink 5 in the direction of data flow. They are conducted to the data sink 4, which has a screen 9. The decompressed input video data are processed in the data sink 4 into an electrical FBAS signal, which is used to drive the picture tube 9. By means of this video signal, the video signals can be reproduced visually.

The decompressed audio data are conducted, via the data sink 4 and the data source 2, to the data sink 3, 10, where the decompressed audio data are processed, amplified, and are acoustically reproduced by the connected output units in the form of loudspeakers 11. The audio signals conducted through the data line 1

are also processed digitally, especially by equalizing, fading, delay lines, and the like.

This local network of Figure 1 has a very economical data source 2, which has no bit stream decoder, and which outputs the generated audio and video data in compressed form to the data line 1. This loading of the network with compressed data by the data source 2 results in efficient utilization of the transmission capacity of the network. Furthermore, the local network has a single bit stream decoder 6 in a central data sink 3. This single bit stream decoder decodes the compressed audio and video data which are jointly conducted to it from the data source 2, and conducts the decompressed data, via the optical data line 1, to the appropriate output units 9, 11, where they are reproduced. The use of a single bit stream decoder 6 results in a very economical design for the local network.

The bit stream decoder 6 is able to decode the compressed audio data and decompressed video data jointly and simultaneously in accordance with the particular compression format, and to conduct [this word in missing in the German] these decoded, decompressed audio and video data to the separation stage 7, where these decompressed data are separated into individual data streams for audio data and video data. Despite the increased power required for the bit stream decoder 6, this centralization makes the local network very economical. All the more so if several data sources and/or data sinks are present in addition to the single data source 2 and the single data sink 3 for audio data and the single data sink 4 for video data. Through the special design of the local network with the data sink 5, with its central bit stream decoder 6, all of these can be designed without their own bit stream decoder.

This special design of the network, with a ring topology and with a single optical data line 1, in addition prevents undesirable interference from entering the data line. This is of special interest for automotive use of the local network. This especially enhances the electromagnetic compatibility of the local network.

The ring topology makes it possible to do without network nodes, which excellently utilizes the maximum transmission capacity of the optical data line and respectively of the ring network. This achieves a local network which is not only economical but which utilizes its maximum transmission capacity especially efficiently.

The second preferred embodiment of the local network, as shown in Figure 2, has three subscribers 2, 3, 5, which are connected to one another through the optical ring data line 1. The data source 2 corresponds to data source 2, as this is shown in Figure 1. It generates compressed audio and video data and outputs these to the optical data line 1. These data then pass through the data sink 3 to the data sink 5, which, by means of the separation stage 7, divides these compressed audio and video data into compressed audio data and compressed video data. The control unit 8 allocates the data channels in the optical data line 1 of the local network, for transmission of the compressed audio data to the data sink 3, 10, and for transmission of the compressed video data to the output unit 9 for video data.

This output unit 9 has a bit stream decoder 6, which converts the compressed video data into a decompressed video signal, here an electrical RGB signal, which is reproduced on the display of the output unit 9.

The data sink 3, 10 for the compressed audio data also has a bit stream decoder 6, which here is designed as an AC-3 decoder. This AC-3 decoder decodes the compressed audio data, and conducts them to a processing and amplification stage 12, which again conducts the processed and amplified audio signals to the loudspeakers 11. The latter convert the electrical audio signal from the processing and amplification stage 12 into an acoustic audio signal.

This inventive structure of the local network, with a separation stage 7 in the compressed data stream, situated before the respective bit stream decoder 6 assigned to it, optimally utilizes the maximum transmission capacity of the local network. Exclusively compressed audio and video data are transmitted on the optical data lines 1 between the individual subscribers 2, 3, 5. Although this structure has a plurality of bit stream decoders 6, these are designed very specifically only as audio bit stream decoders 6 for decoding compressed audio data or only as video bit steam decoders for decoding compressed video data. Through this specific requirement, it is possible, despite the greater number of bit stream decoders 6, to keep the costs of the local network low, taking into account the optimized efficiency in utilizing the maximum transmission capacity of the network.

List of Reference Symbols

1 Optical data line

2 Data source

3 Data sink for the transmitted audio data

4 Data sink for the transmitted video data

5 Data sink

6 Bit stream decoder

7 Separation stage

8 Control unit

9 Output unit for video data

10 Data sink

11 Loudspeaker

12 Processing and amplification unit for audio signals

Claims

1. A local network with several subscribers, which are connected to a ring network by means of an optical data line (1) to transmit audio and/or video data as well as control data,

with at least one subscriber (2), which is configured as a data source (2) for compressed audio and video data,

with at least one subscriber (3), which is configured as a data sink (3) for the transmitted audio data,

and with at least one more subscriber (4), which is configured as a data sink (4) for the transmitted video data,

such that at least one data sink (5) has a bit stream decoder (6) associated with it, to decode the incoming audio and video data, a separating stage (7) to separate the jointly transmitted audio and video data, and a control unit (8) which is designed to conduct one type of transmitted data to an output unit (9) for reproduction, said output unit being associated with the data sink (5), and to conduct the other type of data, via the optical data line (1), to another data sink (10), which forwards its incoming data to its associated output unit (11) for reproduction.

2. The local network of Claim 1, characterized in that the bit stream decoder (6) is situated before the separation stage (7) in the data stream of the compressed audio and video data.

3. The local network of Claim 2, characterized by several other data

sinks which do not have any bit stream decoders and which forward the data conducted to them by the bit stream decoder of the data sink (5) to the output units associated with them.

4. The local network of one of the preceding claims, characterized in that the data sink (5) with its bit stream decoder (6) is separate from the other data sinks (3, 4, 10) and is connected through an optical data line.

5. The local network of Claims 1 and 4, characterized in that the data sink (5) is connected to its associated output unit (9) for reproducing one type of data, through a common optical data line (1) for transmitting audio as well as video data.

6. The local network of Claim 1, characterized in that the bit stream decoder (6) associated with the data sink (5) is situated in the data stream of compressed audio and video data after the separation stage (7) of the data sink (5), and that at least one other bit stream decoder (6) in the other data sinks (3, 4, 10) decodes the separated data that are transmitted through the optical data line.

7. The local network of one of the preceding claims, characterized in that the bit stream decoder (6) is an MPEG-1 decoder, an MPEG-2 decoder, an AC-3 decoder, and/or a JPEG decoder.

8. The local network of one of the preceding claims, characterized in that the bit stream decoder (6) can be switched, by means of the transmitted control data, as an MPEG-1 decoder, MPEG-2 decoder, AC-3 decoder, or JPEG decoder.

9. A method for reproducing audio and video data in a local network according to Claim 1, characterized in that compressed audio and video data are conducted from a data source (2), through the optical data line (1), to a data sink (5), and that, in this data sink (5), the compressed audio and video data are decoded by means of the bit stream decoder (6), and then are separated by a separation stage (7) into audio data and video data, and that these separated data are conducted to the separate output units (9, 11) for audio data and video data respectively, and are reproduced there, at least one type of the decoded data being transmitted through the optical data line (1).

10. A method for reproducing audio and video data in a local network in accordance with Claim 6, characterized in that the compressed audio and video data are conducted from a data source (2), via the optical data line (1), to a data sink (5), that, in the latter, the compressed audio and video data are separated by means of a separation stage (7), and these separated compressed data are conducted to different bit stream decoders (6) in different data sinks (5, 3, 10), are decoded and then reproduced there, at least one type of compressed data being transmitted through the optical data line (1).

PCT

WELTORGANISATION FÜR GEISTIGES EIGENTUM
Internationales Büro

INTERNATIONALE ANMELDUNG VERÖFFENTLICHT NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT)

(51) Internationale Patentklassifikation 7 : H04L 12/64 | A1

(11) Internationale Veröffentlichungsnummer: WO 00/69130

(43) Internationales Veröffentlichungsdatum: 16. November 2000 (16.11.00)

(21) Internationales Aktenzeichen: PCT/EP00/01375

(22) Internationales Anmeldedatum: 19. Februar 2000 (19.02.00)

(30) Prioritätsdaten:
199 21 626.6 10. Mai 1999 (10.05.99) DE

(81) Bestimmungsstaaten: JP, KR, US, europäisches Patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Veröffentlicht
Mit internationalem Recherchenbericht.

(71) Anmelder *(für alle Bestimmungsstaaten ausser US)*: XSYS INTERACTIVE RESEARCH GMBH [DE/DE]; Roggenbachstrasse 6, D–78050 Villingen–Schwenningen (DE).

(72) Erfinder; und
(75) Erfinder/Anmelder *(nur für US)*: STIEGLER, Andreas [DE/DE]; Epernaystrasse, D–76275 Ettlingen (DE). TEICHNER, Detlef [DE/DE]; Ortinstrasse 51, D–78126 Königsfeld (DE). MAIER, Michael [DE/DE]; Arendtstrasse 54, D–78054 Villingen–Schwenningen (DE).

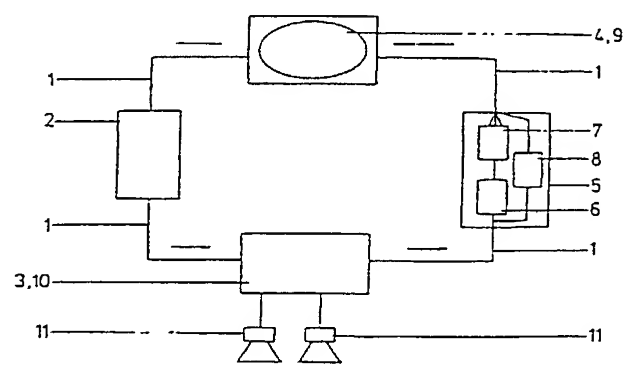
(74) Anwalt: WESTPHAL, MUSSGNUG & PARTNER; Waldstrasse 33, D–78048 Villingen–Schwenningen (DE).

(54) Title: LOCAL NETWORK AND METHOD FOR REPRODUCING AUDIO AND VIDEO DATA IN A NETWORK OF THIS TYPE

(54) Bezeichnung: LOKALES NETZWERK UND VERFAHREN ZUR WIEDERGABE VON AUDIO– UND VIDEODATEN IN EINEM SOLCHEN NETZWERK

(57) Abstract

The invention relates to a local network with several subscribers that are interconnected by an optical data line (1) for transmitting audio and/or video data and that are connected to a ring network by control data. At least one subscriber of the local network is configured as a data source (2) for compressed audio and video data, for example as a DVD player. At least one subscriber represents a data think (3) for audio data and at least one subscriber (4) represents a data think for transmitted video data. A data think (5) of the local network comprises a designated bit stream decoder (6) for decoding the incoming compressed audio and video data, a separating stage (7) for separating the jointly transmitted audio data from the video data and a control unit, which controls the transmission of the decoded, separate data to the output units (9, 11). The decoded, separate audio data and/or the video data are transmitted to their data thinks (4, 3) by the optical data line (1) and to the output units (9, 11) that are allocated to said data thinks. The inventive configuration or a local network is very economical and makes very efficient use of the transmission capacity of a network.



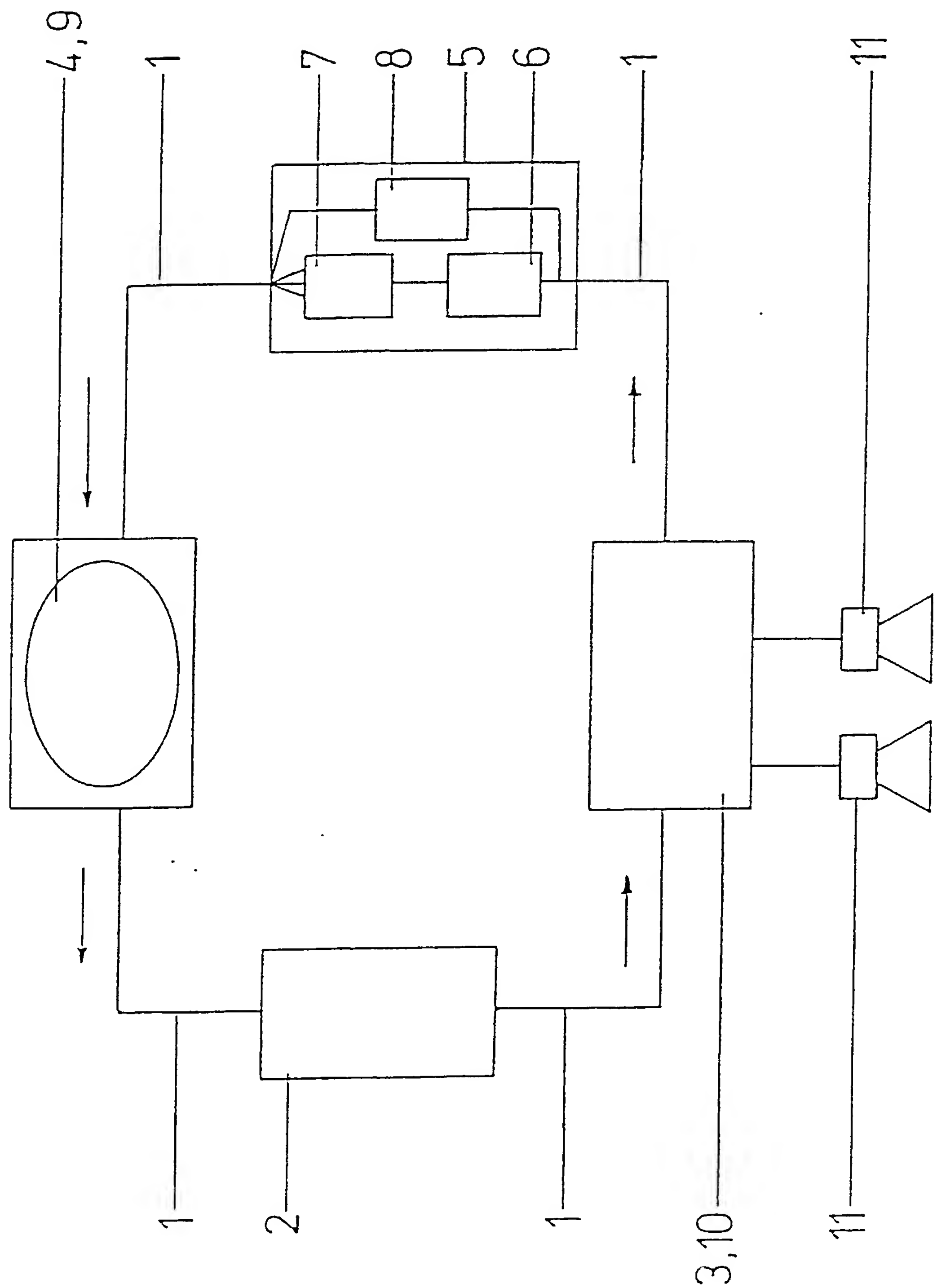


FIG 1

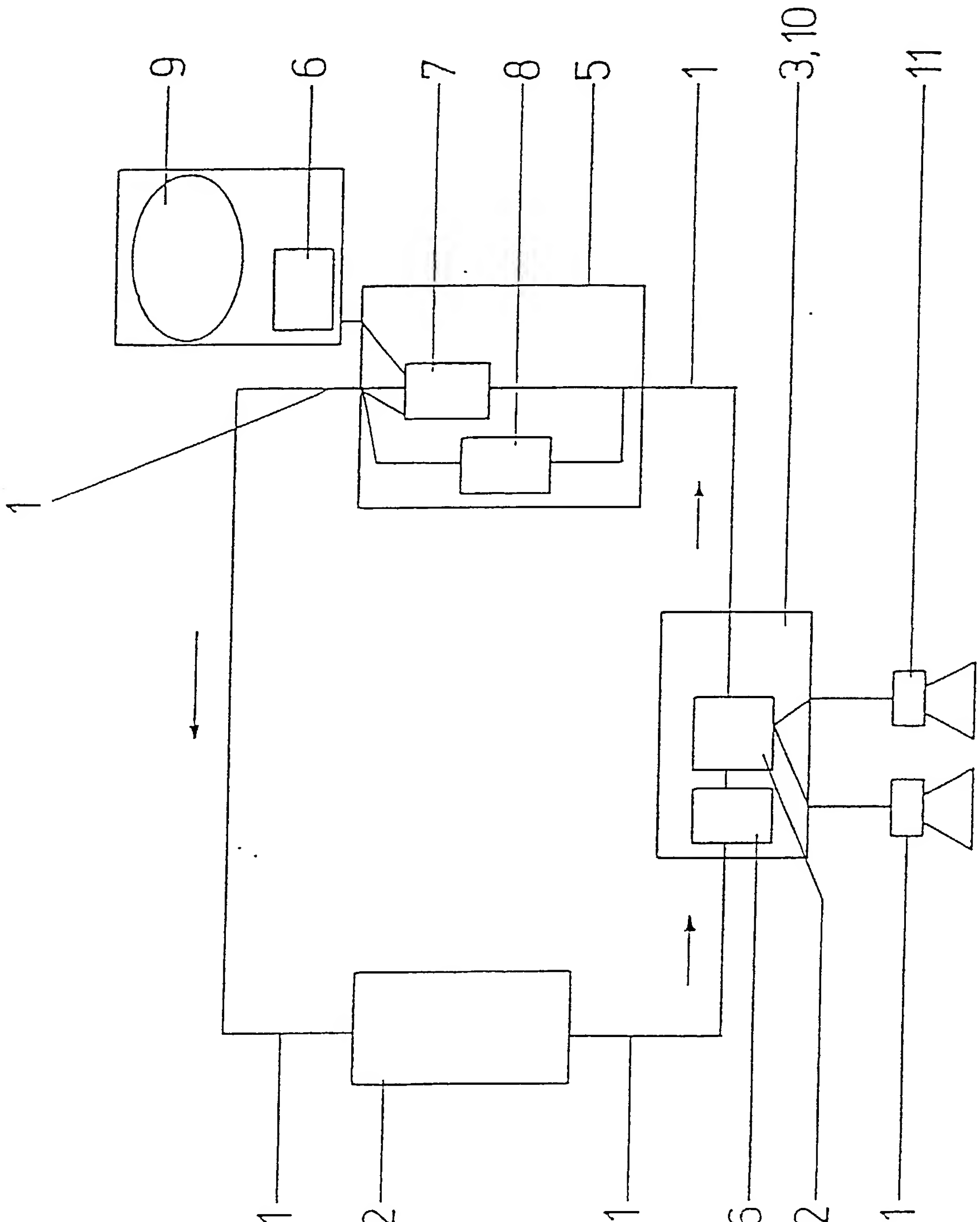


FIG 2

XSY 00545

Docket No: 6492

DECLARATION AND POWER OF ATTORNEY

We, the below named inventors, hereby declare that:

Our residences, post office addresses, and citizenships are as stated below next to our respective names.

We believe we are the original, first, and joint inventors of the subject matter which is claimed and for which a patent is sought on the invention entitled **LOCAL NETWORK AND METHOD FOR REPRODUCING AUDIO AND VIDEO DATA IN A NETWORK OF THIS TYPE**, the specification of which was filed with the United States Patent and Trademark Office on November 3, 2001 and designated Serial No. 10/009,385.

We hereby state that we have reviewed and understand the contents of the above-identified specification, including the claims.

We acknowledge the duty to disclose information which is material to patentability in accordance with Title 37, Code of Federal Regulations, Section 1.56.

We hereby claim foreign priority benefits under Title 35, United States Code §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate filed by us on the same subject matter having a filing date before that of the application on which priority is claimed: German Patent Application No. 199 21 626.6 filed May 10, 1999, and International Application No. PCT/EP00/01375 filed February 19, 2000.

We hereby declare that all statements are made hereby of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

And we hereby appoint:

8

Maurice E. Gauthier	-	Reg. No. 20,798
Richard L. Stevens	-	Reg. No. 24,445
Matthew E. Connors	-	Reg. No. 33,298
William E. Hilton	-	Reg. No. 35,192
Patrick J. O'Shea	-	Reg. No. 35,305
Arlene J. Powers	-	Reg. No. 35,985
Richard J. Stevens, Jr.	-	Reg. No. 44,357
Peter Stecher	-	Reg. No. 47,259

all of the firm of Samuels, Gauthier & Stevens, our attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

We request that all correspondence be directed to:

Patrick J. O'Shea, Esq.
Samuels, Gauthier & Stevens, LLP
225 Franklin Street, Suite 3300
Boston, MA 02110

1-00 Andreas Stiegler — Date: 23.5.02

Residence: Epemaystrasse 34
D-76275 Ettlingen
GERMANY DEX

Citizenship: German

Post Office Address: Same as above

2-00 Detlef Teichner — Date: 02-02-25

Residence: Ortinstrasse 51
D-78126 Königsfeld
GERMANY DEX

Citizenship: German

Post Office Address: Same as above

3-00 Michael Maier — Date: 02-02-26

Residence: Arendtstrasse 54
D-78054 Villingen-Schwenningen
GERMANY DEX

Citizenship: German

Post Office Address: Same as above